CCE 1 Literature Survey

Team code: TY9 8_A
Team Member 1: Vansh Lilani , 37, 9324704780
Team Member 2: Varadraj Mokashi, 40, 8652219255
Team Member 3: Soham Phulare, 49, 7021985725

Tentative Title: Holistic Cryptocurrency Financial Analysis Using AI/ML Techniques
Domain: Cryptocurrency financial analysis using AIML
Sub Domain: AI/ML-Driven Cryptocurrency Financial Forecasting
Objective Description: To analyze and compare deep learning and sentiment-driven models for cryptocurrency price and volatility prediction, aiming to improve accuracy, reliability, and risk management in highly volatile markets.

Team Member 1: Vansh Lilani

PICO 1

- **Paper Title:** Cryptocurrency Price Prediction using Deep Learning Architecture
- **Authors of paper:** Mallqui, D. C. A., & Fernandes, R. A. (2019)
- **Paper Description:**
    - **Problem Statement:** Cryptocurrency price prediction is challenging due to volatility, dynamic trends, and non-linear dependencies.
    - **Intervention:** A CNN deep learning model optimized with genetic algorithms for parameter tuning.
    - **Comparison:** Benchmarked against GRU, deep forward neural networks, and boosted tree models.
    - **Outcome:** Achieved the lowest mean absolute percentage error (MAPE = 0.08) and highest explained variance (0.96), outperforming all baselines.

PICO 2

- **Paper Title:** Hybrid Cryptocurrency Forecasting Model for Altcoins Using GRU and LSTM
- **Authors of paper:** Shah, D., Isah, H., & Zulkernine, F. (2020)
- **Paper Description:**
    - **Problem Statement:** Altcoin prices such as Litecoin and Zcash strongly depend on Bitcoin, yet most models ignore interdependencies.
    - **Intervention:** A hybrid GRU-LSTM forecasting model incorporating parent coin (BTC) influence.
    - **Comparison:** Traditional approaches that forecast altcoins without considering parent coin effects.
    - **Outcome:** Improved forecasting accuracy and enhanced real-time applicability by accounting for cross-coin dependencies.

PICO 3

- **Paper Title:** A Novel Cryptocurrency Price Prediction Model Using GRU, LSTM and bi-LSTM Machine Learning Algorithms
- **Authors of paper:** Hamayel, M. J., & Owda, A. Y. (2021)
- **Paper Description:**
    - **Problem Statement:** Predicting Bitcoin, Ethereum, and Litecoin prices is difficult due to their volatility and dynamic fluctuations.
    - **Intervention:** Applied GRU, LSTM, and Bi-LSTM recurrent neural network models for price forecasting.
    - **Comparison:** Compared predictive performance among the three RNN models.
    - **Outcome:** GRU achieved the most accurate predictions with MAPE values of 0.2454%–0.8267%, while Bi-LSTM performed the worst.

PICO 4

- **Paper Title:** Cryptocurrency Price Prediction Using Probabilistic Deep Learning
- **Authors of paper:** Golnari, A., Komeili, M. H., & Azizi, Z. (2024)
- **Paper Description:**
    - **Problem Statement:** Cryptocurrency markets are highly volatile, and traditional models lack mechanisms to capture uncertainty.
    - **Intervention:** A probabilistic GRU (P-GRU) model generating probability distributions of price forecasts, enhanced with transfer learning.
    - **Comparison:** Compared against standard GRU, LSTM, and probabilistic LSTM models.
    - **Outcome:** Provided more reliable forecasts with quantified uncertainty, enabling better risk management, and successfully transferred learning from BTC to six other coins (ETH, LTC, TRX, DOT, ADA, XLM).

PICO 5

- **Paper Title:** Deep Learning Models for Forecasting Cryptocurrency Prices
- **Authors of paper:** McNally, S., Roche, J., & Caton, S. (2018)
- **Paper Description:**
    - **Problem Statement:** Bitcoin price prediction using conventional statistical methods like ARIMA shows limited accuracy.
    - **Intervention:** Deep learning models such as LSTM and Bayesian-optimized recurrent neural networks for forecasting.
    - **Comparison:** Compared with ARIMA and other traditional statistical models.
    - **Outcome:** LSTM achieved the best accuracy, confirming that deep learning methods significantly outperform classical time-series forecasting approaches.

Team Member 2: Varadraj Mokashi

PICO 1

- **Paper Title:** A novel hybrid cryptocurrency forecasting model integrating sentiment analysis and advanced neural networks
- **Authors of paper:** Adrian Vieitez, Matilde Santos, Rodrigo Naranjo
- **Paper Description:**
    - **Problem Statement:** Cryptocurrency prices are highly volatile and influenced by market sentiment, making traditional prediction methods unreliable.
    - **Intervention:** Hybrid forecasting model integrating sentiment analysis and advanced neural networks.
    - **Comparison:** Compared against standalone ML/DL models and conventional forecasting techniques.
    - **Outcome:** Achieved higher predictive accuracy and robustness, showing that sentiment-enriched hybrid models improve forecasting reliability.

PICO 2

- **Paper Title:** Explainable deep reinforcement learning for financial trading strategies
- **Authors of paper:** Raúl Gomez-Martínez, Mara Luisa Medrano-Garcia
- **Paper Description:**
    - **Problem Statement:** Financial markets demand transparency in AI models; black-box DRL reduces trust in automated strategies.
    - **Intervention:** Explainable DRL framework applied to trading strategy development.
    - **Comparison:** Benchmarked against traditional DRL and non-explainable AI trading systems.
    - **Outcome:** Delivered competitive profitability while providing interpretability, making AI strategies more trustworthy for practitioners.

PICO 3

- **Paper Title:** An Improved Machine Learning-Driven Framework for Cryptocurrencies Price Prediction With Sentimental Cautioning

- **Authors of paper:** Muhammad Zubair, Jaffar Ali, Musaed Alhussein, Shoaib Hassan, Khursheed Aurangzeb, Muhammad Umair

- **Paper Description:**

    - **Problem Statement:** Cryptocurrency forecasting suffers from errors due to volatility and neglect of sentiment-driven market dynamics.

    - **Intervention:** Multi-domain ML framework using Bi-LSTM + GRU for time-series forecasting and BERT + VADER for sentiment cautioning.

    - **Comparison:** Outperforms existing technical-only and sentiment-only models.

    - **Outcome:** Significantly lower RMSE values across BTC, ETH, and DOGE, plus sentiment-based alerts that improve investor risk management.

PICO 4

- **Paper Title:** OPTICALS: A Novel Framework for Optimizing Predictive Trading Indicators in Cryptocurrency Using Advanced Learning Simulations

- **Authors of paper:** Hasib Shamshad, Fasee Ullah, Syed Adeel Ali Shah, Muhammad Faheem, Beena Shamshad

- **Paper Description:**

    - **Problem Statement:** Cryptocurrency markets are volatile; traders lack transparent, actionable forecasting tools with model interpretability.

    - **Intervention:** OPTICALS framework integrating ML (XGBoost, LightGBM) and DL (LSTM, Bi-LSTM, GRU) with hyperparameter optimization and look-back window parameters.

    - **Comparison:** Benchmarks gradient boosting models vs. recurrent neural networks under optimized training.

    - **Outcome:** GRU proved superior for day trading; XGBoost worked best for swing trading, offering practical tools for different investor strategies.

PICO 5

- **Paper Title:** Cryptocurrency price prediction using machine learning and sentiment analysis

- **Authors of paper:** Susanna Levantesi , Gabriella Piscopo, Alba Roviello
- **Paper Description:**

    - **Problem Statement:** Crypto price forecasts using single-domain factors fail due to multi-factor market influences.

    - **Intervention:** BLGBV (Bi-LSTM + GRU + BERT + VADER) hybrid model with sentiment analyzer and alert mechanism.

    - **Comparison:** Evaluated against prior uni-domain ML/DL models that showed higher prediction errors.

    - **Outcome:** Produced highly precise predictions with RMSE of 0.0241% (BTC), 0.0645% (ETH), and 0.0978% (DOGE), outperforming benchmarks.

Team Member 3: Soham Phulare

PICO 1

- **Paper Title:** Investor Sentiment and the Holiday Effect in the Cryptocurrency Market: Evidence from China
- **Authors of paper:** Pengcheng Zhang
- **Paper Description:**
    - **Problem Statement:** The cryptocurrency market in China shows abnormal return patterns around holidays, and investor sentiment may explain these anomalies.
    - **Intervention:** Construction of a sentiment indicator using textual analysis to capture mood effects.
    - **Comparison:** Market returns during holidays without sentiment adjustment (baseline holiday effect).
    - **Outcome:** Positive investor sentiment reduces the holiday effect on cryptocurrency returns, showing sentiment plays a mediating role.

PICO 2

- **Paper Title:** Sentiment-Driven Cryptocurrency Forecasting: Analyzing LSTM, GRU, Bi-LSTM, and Temporal Attention Model (TAM)
- **Authors of paper:** Phumudzo Lloyd Seabe
- **Paper Description:**
    - **Problem Statement:** Bitcoin forecasting models often underperform because they neglect fine-grained sentiment from social media.
    - **Intervention:** Bi-LSTM model incorporating RoBERTa-based sentiment embeddings from Twitter.
    - **Comparison:** Other deep learning models (LSTM, GRU, TAM) using VADER sentiment features.
    - **Outcome:** Bi-LSTM with RoBERTa achieved the lowest MAPE (2.01%), proving the effectiveness of advanced NLP sentiment features.

PICO 3

- **Paper Title:** Bitcoin Price Prediction Using Sentiment Analysis and Empirical Mode Decomposition
- **Authors of paper:**Serdar Arslan
- **Paper Description:**
    - **Problem Statement:** Bitcoin's price movements are complex and influenced by external sentiment factors, which are often excluded in time-series models.
    - **Intervention:** Parallel LSTM networks combining EMD-decomposed price data with Twitter sentiment signals.
    - **Comparison:** Price-only forecasting models without sentiment integration.
    - **Outcome:** Sentiment-augmented models significantly outperformed baselines, confirming the predictive power of social signals.

PICO 4

- **Paper Title:** Crypto Volatility Forecasting: Mounting a HAR, Sentiment, and Machine Learning Models
- **Authors of paper:** Alexander Brauneis
- **Paper Description:**
    - **Problem Statement:** Traditional models like HAR struggle to predict high volatility in cryptocurrencies due to their non-linear and sentiment-driven dynamics.
    - **Intervention:** Advanced ML/DL models (LSTM, LightGBM, CNN-BiLSTM, MLP, XGBoost) incorporating sentiment data.
    - **Comparison:** Standard HAR model without sentiment factors.
    - **Outcome:** ML/DL models outperformed HAR; incorporating sentiment further improved non-linear models' accuracy in volatility forecasting.

PICO 5

- **Paper Title:** Deep Learning for Bitcoin Price Direction Prediction: Models and Trading Strategies Empirically Compared
- **Authors of paper:** Alexander Brauneis
- **Paper Description:**
    - **Problem Statement:** Predicting Bitcoin's price direction is difficult; trading strategies based on weak models can be unprofitable.
    - **Intervention:** Deep learning architectures (CNN-LSTM, LSTNet, TCN) with feature selection techniques (Boruta, GA, LightGBM).
    - **Comparison:** ARIMA models and DL models without feature selection.
    - **Outcome:** CNN-LSTM with Boruta achieved 82.44% directional accuracy; backtested trading strategy yielded returns up to 6654% annually, far exceeding baselines.

Github Link: https://github.com/Soham2805/Research-Practices